

## REPORT OF PROFESSOR JOSHUA MITTS, PhD

### I. INTRODUCTION

- 1) This report summarises the findings of an investigation into the manipulation of the share price of Burford Capital's common stock on 6 and 7 August 2019. As explained below, my analysis shows that market manipulation in the form of spoofing and layering caused an artificial decline in Burford's share price.
- 2) On 6 August 2019 at 1:30pm BST, Muddy Waters tweeted that it would announce a new short position the following day, without referring to Burford. On 7 August at 8:53am BST, Muddy Waters tweeted a link to a short report on Burford. Burford's share price declined by 18.83% on 6 August and an additional 46.03% on 7 August.
- 3) I analyse order book data for these dates and identify strong evidence of spoofing and layering, *i.e.*, the creation and cancellation of a large volume of limit orders which distorts the supply and demand for a security. Spoofing and layering has long been recognised as a form of illegal market manipulation.
- 4) Specifically, and as further described below:
  - a) On 6 August, after the posting of the Muddy Waters tweet at 1:30pm BST, the share volume of sell-side order cancellations in Burford's stock skyrocketed, increasing 5-fold over the pre-tweet period. The evidence of spoofing and layering on 7 August is even stronger. I find that 91.77 million sell-side shares were created and cancelled after the Muddy Waters tweet on 7 August, reflecting £540 million in

cancelled order dollar volume using average execution prices—a 17-fold increase over the pre-tweet period on 6 August.

- b) I compare those sell-side order cancellations to: (a) the share volume of sell-side orders which were created at the same time; and (b) the share volume of buy-side order cancellations, to establish that the surge in sell-side order cancellations was not due either to a flood of sell orders based on information in the market or to rapid movements in price that would lead to more cancellations on both the sell and buy side of the order book. I measure a 119-fold increase in the share volume of sell-side order cancellations following the Muddy Waters tweet on 7 August after adjusting for the share volume of buy-side order cancellations.
- c) In addition, I use regression analysis with single and double controls to account for the ordinary cancellations one would attribute to a day of extreme movements in price, and exclude that as an explanation for the findings. The data show not only that there was a wave of sell order cancellations but also a consistent accumulation of statistically abnormal cancellations. I find the net sell-side cancellation imbalance—sell-side order cancellations in excess of buy-side order cancellations—not explained by ordinary cancellation rates amounted to 1,055,747 and 10,432,638 shares on 6 and 7 August, respectively. In my opinion, this surge of net sell-side order cancellations is strongly indicative of spoofing and layering.
- d) Moreover, I identify specific patterns of order cancellations which are consistent with intentional manipulation rather than ordinary market making. For example, following the Muddy Waters tweets on 7 August I measure a 29-fold increase in the intensity of sell-side order cancellations preceding buy-side order executions, a clear pattern which indicates intentional manipulation of Burford's share price.

- e) I conclude that the decline in the price of Burford's stock on 6 and 7 August was driven by large waves of sell-side order cancellations. During five one-minute periods on 6 August, Burford's stock fell 6.5%, or over £170 million. During these periods, on average, 72,821 net sell-side shares were cancelled per minute (*i.e.*, after subtracting buy-side order cancellations). Similarly, during ten one-minute periods on 7 August, Burford's stock fell 48.6%, or over £868 million. During these periods, on average, 46,860 net sell-side shares were cancelled per minute. By way of comparison, from 1 July to 31 July 2019, on average 0.21 net sell-side shares were cancelled per minute—orders of magnitude smaller than on 6 and 7 August. The extremely large net sell-side cancellation volume during the minutes when Burford's share price decreased is strong evidence that the price decline on 6 and 7 August 2019 was not induced by ordinary trading in Burford's stock.
- 5) In my opinion, this evidence indicates that: (a) Burford's stock was subject to market manipulation in the form of spoofing and layering on 6 and 7 August; and (b) the decline in the price of Burford's stock on those dates was driven by large waves of sell-side order cancellations.

## **II. BACKGROUND AND OVERVIEW**

### **A. Overview of Spoofing and Layering**

- 6) Two types of behavior which send a false pricing signal to the market are *spoofing* and *layering*.<sup>1</sup> It is my understanding that spoofing and layering are prohibited by English and EU law. The Market Abuse Regulation prohibits the “the placing of

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<sup>1</sup> Sec. & Exch. Comm'n v. Lek Sec. Corp., 276 F. Supp. 3d 49, 60 (S.D.N.Y. 2017).

orders to a trading venue, including any cancellation or modification thereof. . . creating or being likely to create a false or misleading signal about the supply of, or demand for, or price of, a financial instrument.”<sup>2</sup> Moreover, in *Navinder Singh Sarao v. The Government of the United States of America*, the High Court held that spoofing and layering violated the Fraud Act and Financial Services Act 2012.<sup>3</sup>

- 7) While the precise use of these terms can vary, spoofing generally refers to placing a high volume of orders at a price equal to or better than the national best-bid-best-offer (NBBO) and subsequently cancelling these orders to move the price in a given direction without taking on any economic exposure.<sup>4</sup> For example, suppose the current national best offer is £9.99 per share. A trader engaged in spoofing might place a high volume of sell orders at £9.98, causing the best offer to decline to £9.98, immediately cancel those sell orders before they can execute and then place a high volume of new sell orders at £9.97. Repeatedly placing and cancelling sell orders at or below the best offer artificially drives down the share price.
- 8) Layering is similar to spoofing except that instead of placing and cancelling a high volume of orders at the NBBO the manipulator places these orders deeper in the order book, *i.e.*, at prices *above* the best offer or *below* the best bid.<sup>5</sup> Continuing the

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<sup>2</sup> Regulation (EU) No 596/2014, Art. 12.

<sup>3</sup> [2016] EWHC 2737 (Admin).

<sup>4</sup> See, e.g., FINRA, *Press Release: FINRA and Exchanges Charge Lek Securities and CEO Samuel F. Lek with Aiding and Abetting Securities Fraud*, Mar. 27, 2017, <https://www.finra.org/newsroom/2017/finra-exchanges-charge-lek-securities-its-ceo-aiding-abetting-securities-fraud> (“Spoofing is a form of manipulation that can involve entering non-*bona fide* orders with the intention of cancelling those orders once they trigger some type of market movement or response from other market participants from which the manipulator can profit.”).

<sup>5</sup> *Id.* (“Layering can involve a pattern in which multiple, non-*bona fide* limit orders are entered on one side of the market at various price levels to create the appearance of a change in the supply and demand of the

prior example, suppose the manipulator worries that these sell orders at £9.98 will be inadvertently executed before they can be cancelled. Instead of placing these orders at £9.98 (or £9.99, the original best offer), the manipulator may place a high volume of orders at £10.01, £10.05, or some other price slightly above £9.99.

- 9) A high volume of orders deeper in the limit order book can move the price of the stock for several reasons. First, volume in the limit order book suggests that some market participant(s) may possess information as to the future direction of the share price. Even if the probability that the trader possess information is low, market makers will adjust the price up or down to some extent.<sup>6</sup>
- 10) It is important to recognise that heavy trading is not the only driver of price changes. Prices can also change when market makers observe variation in supply and demand and adjust their quotes (*i.e.*, the best bid and best offer) for a security accordingly. Suppose a market maker adjusts down a quote from £10.00 to £9.50 in response to the appearance of excess supply for the security. It only takes a single trade at the new quote of £9.50 to adjust the “price” of the security down by £0.50 (*i.e.*, the last trading price)—even if there was no other trading in the security.
- 11) Second, a large volume of sell (or buy) orders above the best offer (or bid) creates a “wall” of supply (or demand) which may prevent the price from rising or falling further. Suppose a trader observed the sell-side manipulation and attempted to

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security so that the manipulator can obtain better-priced executions on orders entered on the opposite side of the market; the non-*bona fide* orders are then cancelled.”).

<sup>6</sup> The presence of imbalanced order flow is well-understood in the finance literature as a sufficient condition for risk-neutral, uninformed market makers to adjust the prices at which they will trade. See, e.g., Lawrence R. Glosten & Paul R. Milgrom, *Bid, Ask and Transaction Prices in a Specialist Market With Heterogeneously Informed Traders*, 14 J. FIN. ECON. 71 (1985).

reverse the price decline by buying large quantities of the stock. The presence of a high volume of sell orders deeper in the book will effectively absorb this demand, making it more difficult for the price to rise. This possibility, in turn, will deter the trader from engaging in a counter-manipulation strategy to begin with.<sup>7</sup>

- 12) In the wake of the “flash crash” of 2010, a growing literature in financial economics has examined episodes of rapid order cancellations like these, sometimes referred to more generally as “quote bursts.”<sup>8</sup> In particular, one recent peer-reviewed study examines bursts of high-frequency quoting activity, pointing out “quote manipulation strategies at the disposal of the fast market makers” and concluding “it is possible that bursts in quotes are used to introduce price mis-alignment.”<sup>9</sup>

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<sup>7</sup> Moreover, by repeatedly placing and cancelling these orders within a very short time, the manipulator can maintain the downward (or upward) pressure on the price. Indeed, for a layering strategy to succeed, the manipulator must place and cancel these orders at prices which maintain a given distance from the best offer (or bid). Continuing the prior example, suppose the best offer fell to £9.90. Any sell orders placed at £10.05 would be far from the best offer, and thus less effective at signaling negative information or absorbing positive demand. To continue the layering strategy, the manipulator might cancel the £10.05 orders and place a high volume of new sell orders at £9.95.

<sup>8</sup> See, e.g., S. Gencay et al., *Price Impact and Bursts in Liquidity Provision*, 18 QUAN. FIN. 1129 (2018). Scholars have documented a dramatic rise in quote cancellations and sub-second volatility contemporaneous with the rise of high-frequency trading, Joel Hasbrouck & Gideon Saar, *Low-Latency Trading*, 16 J. FIN. MARKETS. 646 (2013), and there is an ongoing debate over the extent of manipulative order flow in the public markets. See, e.g., Joel Hasbrouck, *High Frequency Quoting: Short-Term Volatility in Bids and Offers*, 53 J. FIN. & QUAN. ANALYSIS 613 (2018).

<sup>9</sup> Gencay et al., *supra* note 8, at 1131.

## B. Why Does the Price Not Bounce Back?

- 13) Should one expect a stock like Burford to bounce back immediately after being subject to spoofing and layering? There are two reasons why Burford's share price is less likely to rapidly reverse direction in response to a manipulative short attack.
- 14) The first reason is that the very existence of a short seller report followed by a sharp price decline can weigh heavily on the fundamental value of the company, independent of alleged misstatements. Besides giving rise to costly shareholder litigation, short-seller attacks that seem to be "confirmed" by the market undermine investor confidence in the firm and thereby deter investors from immediately repurchasing large quantities of the stock at its depressed value, which would lead to a price increase. Crucially, this loss of investor confidence may have nothing to do with an alleged misstatement or omission by the issuer.
- 15) The second reason is that Burford has a significant retail shareholder base, which tends to place greater weight on the *price itself* as conveying information about the fundamental value of the company.<sup>10</sup>
- 16) Moreover, in the minutes following the short-seller report, market manipulation in the form of spoofing and layering can create a temporary "wall" of excess supply (or demand) that discourages trading in the opposite direction. It has been shown in the finance literature that large trades like these may lead to systematic

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<sup>10</sup> A large literature in finance examines learning from prices. See, e.g., Snehal Banerjee, *Learning From Prices and the Dispersion in Beliefs*, 24 REV. FIN. STUD. 3025 (2011); Snehal Banerjee & Brett Green, *Signal or Noise? Uncertainty and Learning About Whether Other Traders Are Informed*, 117 J. FIN. ECON. 398 (2015).

price distortions as market participants rationally conclude that it would be futile to attempt to counteract the manipulation.<sup>11</sup>

### III. DATA AND DESIGN

- 17) I have obtained the direct feed of order book activity from the London Stock Exchange and LSE Turquoise, the two exchanges which displayed limit orders to buy or sell shares of Burford's stock. I tabulated order creation, cancellation and execution rates in the shares of Burford Capital at high-frequency intervals.
- 18) For the purpose of this analysis, I consider a non-execution update to the price or size of an order as a cancellation of the existing order and creation of a new order at the new size or price. The distribution of order flow over 6 and 7 August 2019 in Burford's stock is set out in the following table.

**Table 1: Distribution of Event Messages**

This table shows the proportion of individual limit order book messages in Burford's stock.

	6 August	7 August
London Stock Exchange	97.47%	96.48%
LSE Turquoise	2.53%	3.52%

- 19) The exchange data contain the stream of order messages in the consolidated limit order book in Burford's stock in anonymised form, *i.e.*, the data does not reveal the identities of the market participants transmitting these order messages. I aggregate the data to 1-minute intervals in order to derive the total volume of orders outstanding, created, and cancelled for the buy and sell side of the order

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<sup>11</sup> See, e.g., Robert A. Jarrow, *Market Manipulation, Bubbles, Corners and Short Squeezes*, 27 J. FIN. QUANT. ANALYSIS 311, 324 (1992) (formally deriving a rational trading strategy which "generates a sequence of market prices . . . manifest[ing] as a *bubble* followed by a *crash*.").



book, as well as these volume of orders within the following price ranges of the best bid and offer at each 1-minute interval: at the best bid or offer, 0-0.25%, 0.25-0.33%, 0.33-0.5%, 0.5-1%, 1-3%, 3-5%, 5-10% and above 10%.

- 20) As these bands are fixed (in percentage terms) relative to the best bid or offer, they facilitate measuring spoofing and layering. For example, suppose that the best offer at 10:00am is £10.00. At the same time, a manipulator offers shares for sale at £10.09. That sell order volume is within 0.5-1% of the best offer. Now imagine that at 10:01am the best offer falls to £9.90. At 10:01am, those shares are within 1-3% of the best offer. If the original sell limit order is not cancelled, the sell order volume within 0.5-1% of the best offer will decline. If the sell order volume within 0.5-1% of the best offer remains unchanged, that implies that the manipulator placed a new sell order at a price between £9.95 and £10.00.
- 21) For this reason, repeatedly placing and cancelling orders in a very short time is strong evidence of manipulative intent. Consider a short seller who genuinely believes a company's stock is overvalued. Suppose, for example, that the firm's stock currently trades at £10.00 per share, and the short seller believes the fundamental value of the company is £9.00 per share—*i.e.*, the shares are overpriced by 10%. With no transaction costs, such a short seller would profit by selling the shares at any price above £9.00. So long as the shares will reach the true, fundamental value of £9.00 per share, the short seller profits by selling above that price.
- 22) To be sure, transaction costs might increase his or her break-even point to some price slightly above £9.00. Nonetheless, there is no economic justification for such a short seller to place a large volume of sell orders at prices *higher* than £10.00, the best offer at that time. Indeed, such a sell order would betray a *lack of genuine belief*

*that the stock is overvalued*: for if the short seller truly believed the share price was too high, he or she would not expect a future *increase* in the price. These high-priced sell orders effectively deprive the short seller of the opportunity to sell at a price between £10.00 and £9.00, the supposed fundamental value of the company.

- 23) The same rationale applies to a trader who seeks to exploit the release of a low-quality short-seller report by manipulating the share price of the issuer downward. If such a trader genuinely believed the short thesis, he or she would place orders at or below the best offer, in an attempt to enter into a profitable short position faster than other market participants.
- 24) But this rationale is inapposite when considering a massive wave of creation and cancellation of limit orders. A trader engaged in such spoofing or layering activity is not enhancing price accuracy because his or her *trades* are not moving the share price. Rather, such a trader is sending a false signal into the market—namely, that there is a wave of supply in the limit order book—while preventing any actual economic exposure by immediately cancelling those orders.<sup>12</sup>

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<sup>12</sup> Academic studies emphasise the rationale for placing and cancelling a limit order *below* the best offer—*i.e.*, *within* the spread—to discover so-called “hidden liquidity” in the market. As Joel Hasbrouck and Gideon Saar explain, “a limit order is submitted within the spread in the hope of either immediately achieving execution against a standing hidden order, or by quickly attracting a new marketable order. If neither occurs within a brief interval, the limit order is cancelled, and we observe a fleeting order.” Joel Hasbrouck & Gideon Saar, *Technology and Liquidity Provision: The Blurring of Traditional Definitions*, 12 J. FIN. MKTS. 143, 144 (2009). But while this rationale applies to orders *below* the best offer, it is inapposite when applied to orders *at or above* the best offer, for it is difficult to imagine why a hidden buyer would be willing to pay *more* than the best offer. Indeed, due to price-time priority rules, a new order at the best offer is equivalent to a new order above the best offer from the standpoint of discovering hidden liquidity. For this reason, creating and immediately cancelling a large volume of sell orders at or above the best offer strongly suggests a manipulative intent to mislead market participants as to the current value of the security rather than expressing a *bona fide* view as to its value.

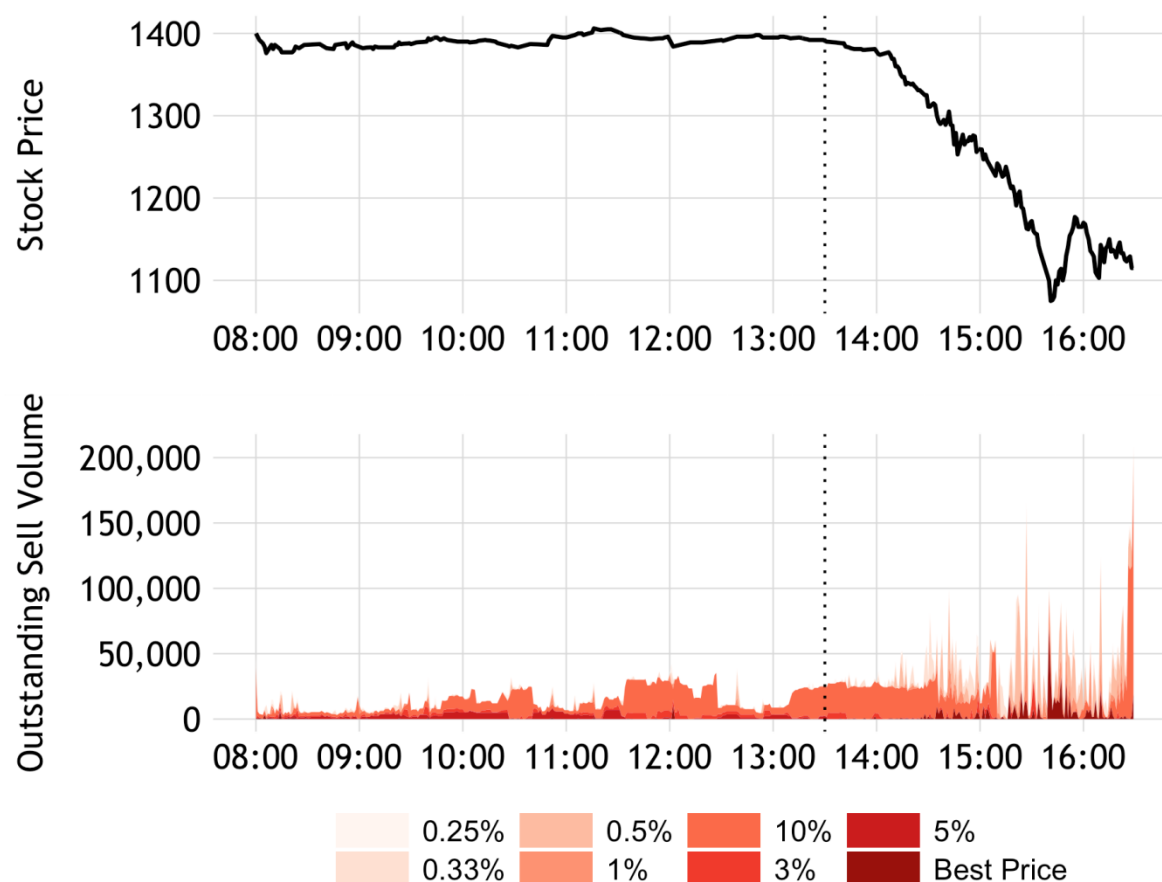
- 25) In my opinion, the data indicates that the decline in the price of Burford's stock on 6 and 7 August 2019 was caused by a wave of abnormal order cancellations at or above the best offer, which is inconsistent with a view by the market that the shares are overvalued and indicates intentional manipulation of Burford's share price. In the following Sections, I describe the facts which have led me to this conclusion.

#### IV. STOCK-PRICE EVOLUTION AND ORDER CANCELLATIONS

- 26) On 6 August 2019 at 1:30pm BST, Muddy Waters posted a tweet stating "Muddy Waters is now in a blackout period until tomorrow 8 am London time when we will announce a new short position on an accounting fiasco that's potentially insolvent and possibly facing a liquidity crunch. Investors are bulled up about this company. We're not."
- 27) Figure 1 plots the price of Burford's stock from 8:00am-4:30pm BST on 6 August 2019, as measured by the price of the last trade in a 1-minute interval, alongside the volume of outstanding sell orders. In Figure 1, the dotted line corresponds to 1:30pm, when this tweet was posted.

**Figure 1: Burford's Share Price and Outstanding Sell Volume on 6 August 2019**

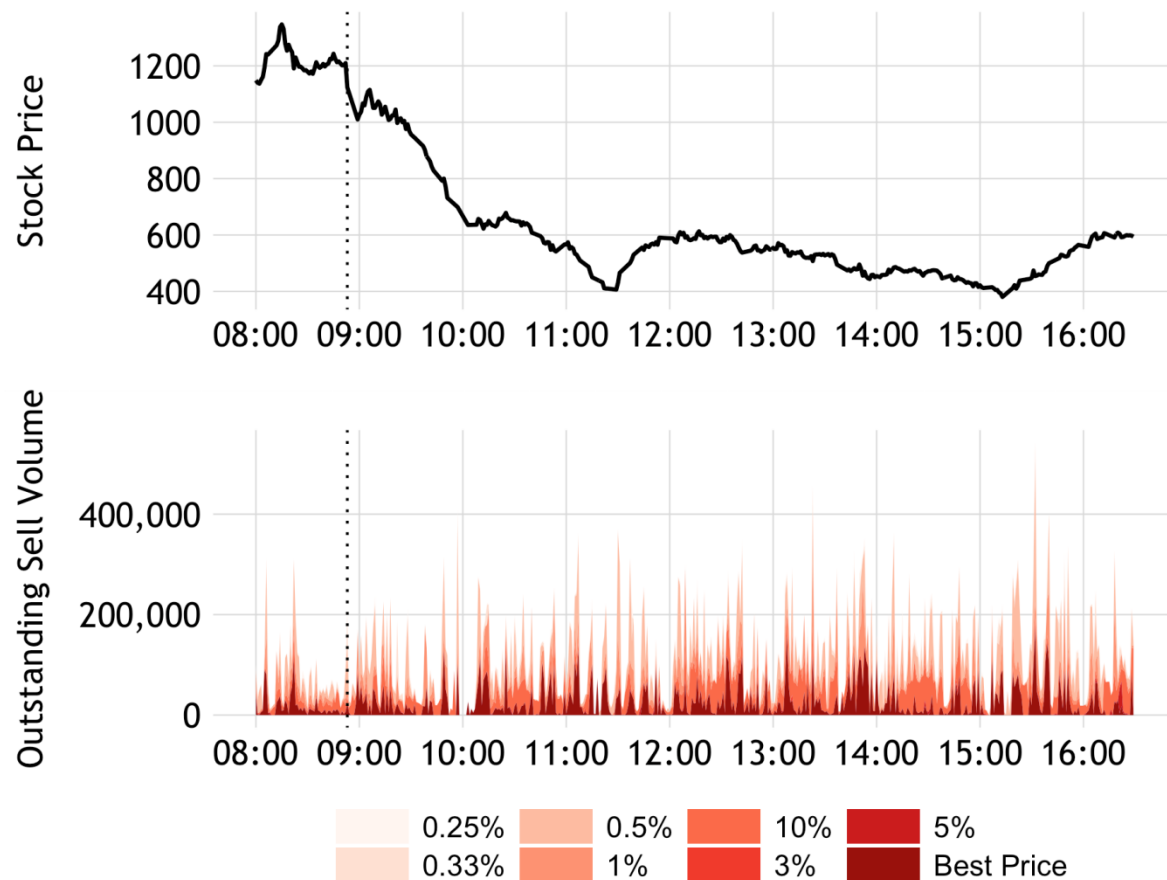
The upper pane of this figure shows Burford's share price on 6 August 2019 at 1-minute intervals. The lower pane shows the outstanding volume of sell orders at the same 1-minute increments. In the lower pane, the depth of Burford's sell-side order book is shown using different shades: the darker shades correspond to sell orders at lower prices, and the lighter shades correspond to sell orders at higher prices. The dotted line reflects the time when the Muddy Waters tweet was posted (1:30pm BST).



- 28) On 7 August 2019 at 8:53am BST, Muddy Waters posts a tweet, "Good morning, London. Apologies for the delay. Wanted to check in with counsel. These \$BUR guys sure do have a guilty look to them, don't they?"
- 29) Figure 2 plots the price of Burford's stock from 8:00am-4:30pm BST on 7 August 2019, as measured by the price of the last trade in a 1-minute interval, alongside the volume of outstanding sell orders. In Figure 2, the dotted line corresponds to 8:53am, when the above Muddy Waters tweet was posted.

**Figure 2: Burford's Share Price and Outstanding Sell Volume on 7 August 2019**

The upper pane of this figure shows Burford's share price on 7 August 2019 at 1-minute intervals. The lower pane shows the outstanding volume of sell orders at the same 1-minute increments. In the lower pane, the depth of Burford's sell-side order book is shown using different shades: the darker shades correspond to sell orders at lower prices, and the lighter shades correspond to sell orders at higher prices. The dotted line reflects the time when the second Muddy Waters tweet was posted (8:53am BST).

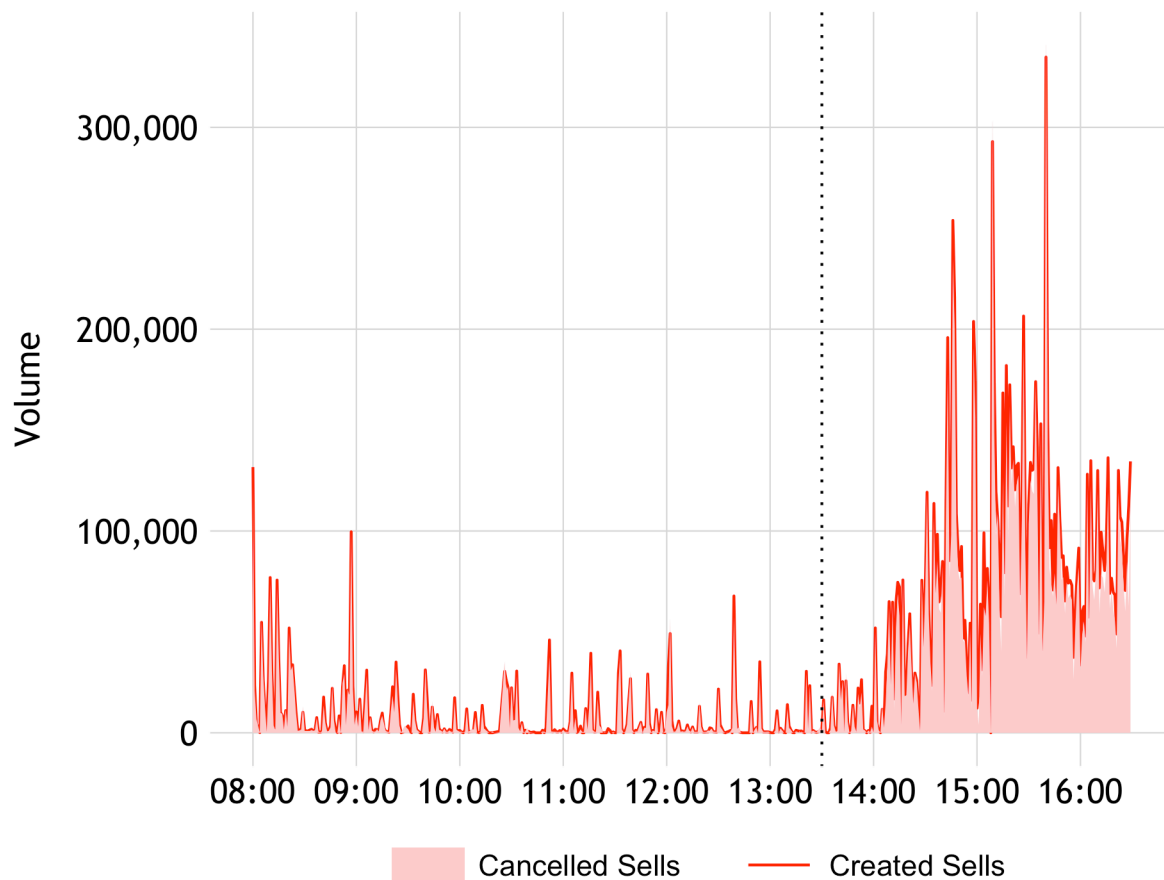


- 30) Immediately following the posting of the tweet on 6 August there is a modest increase in sell orders, but substantially stronger supply arises only later in the day. On 7 August, there is no trend in the volume of outstanding sell orders.
- 31) The key to layering and spoofing is placing and cancelling a very large number of sell orders within a very short time. When these orders are cancelled within the same minute that they are placed, they will not appear as *outstanding* sell orders.

Figure 3 and Figure 4 plots the number of sell orders which were cancelled and created throughout the trading day on 6 and 7 August, respectively.

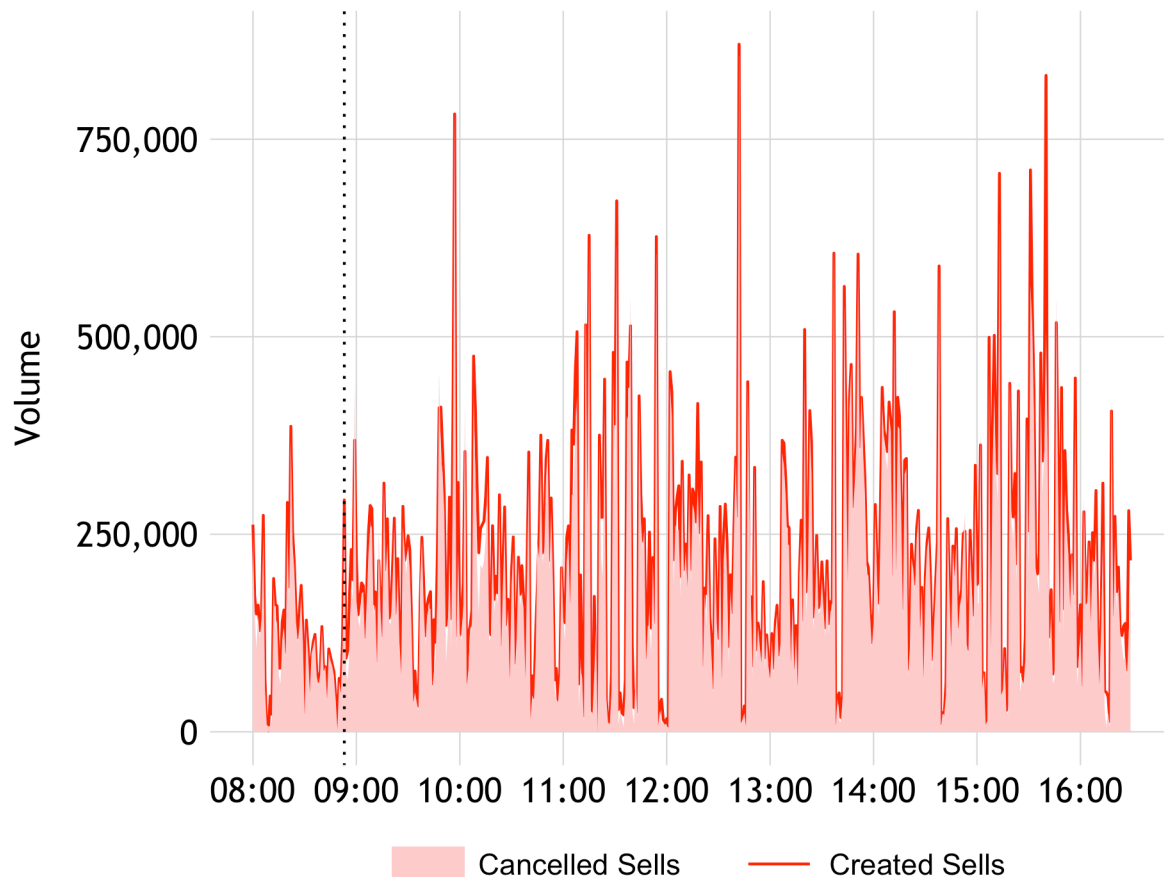
### Figure 3: Created vs. Cancelled Sell Order Flow on 6 August 2019

This figure shows the volume of sell orders for Burford's shares which were created and cancelled on 6 August 2019 at 1-minute intervals, prior to and following the posting of the Muddy Waters tweet. The solid line reflects the volume of created sell orders, while the shaded region reflects cancelled sell orders. The dotted line shows the time when the Muddy Waters tweet was posted (1:30pm BST).



**Figure 4: Created vs. Cancelled Sell Order Flow on 7 August 2019**

This figure shows the volume of sell orders for Burford's shares which were created and cancelled on 7 August 2019 at 1-minute intervals, prior to and following the posting of the Muddy Waters tweet. The solid line reflects the volume of created sell orders, while the shaded region reflects cancelled sell orders. The dotted line shows the time when the Muddy Waters tweet was posted (8:53am BST).



- 32) While the *outstanding* sell volume fluctuated between 69,350 and 81,565 shares in the hours following the posting of the Muddy Waters tweet on 6 August and between 111,398 and 323,705 shares on 7 August, Figure 3 and Figure 4 show that sell orders for share volume on the order of several times that were *cancelled* after the tweet was posted on these dates.
- 33) On 6 August, orders for 2.2 million sell-side shares were cancelled from 8am-1:30pm BST, compared to orders for 12.85 million sell-side shares cancelled after the posting of the Muddy Waters tweet, from 1:30pm to 5pm. Using average

execution prices over those windows, £31.1 million of sell-side orders were cancelled from 8am-1:30pm, compared to £159.1 million after 1:30pm—a 5-fold increase. Similarly, orders for 91.77 million sell-side shares were cancelled after 8:53am on 7 August, reflecting £540 million in orders using average execution prices—a 17-fold increase.

- 34) One might question whether this wave of sell order cancellations simply reflected the adjustment of prices by market makers in the wake of the posting of the Muddy Waters tweet. That explanation makes little sense because market makers tend to set prices by observing order flow, not Twitter posts.<sup>13</sup> Algorithmic traders and sophisticated short sellers, on the other hand, are more likely to take a directional position with respect to the underlying security.
- 35) Moreover, market makers are generally neutral with respect to the fundamental direction of the stock: the provision of liquidity should be no more biased toward the sell side than the buy side.<sup>14</sup> To rule out the concern that these sell orders cancellations are symmetrically matched by buy-side order cancellations which are natural to the provision of liquidity, I plot the same data underlying Figure 3 and Figure 4 but subtract the number of buy orders which were created and cancelled in the same 1-minute interval. This analysis adjusts for the possibility that the observed cancellation rates are simply driven by changes in the price, for such changes should lead to symmetric cancellations on both sides of the order book. The results are shown in Figure 5 and Figure 6.

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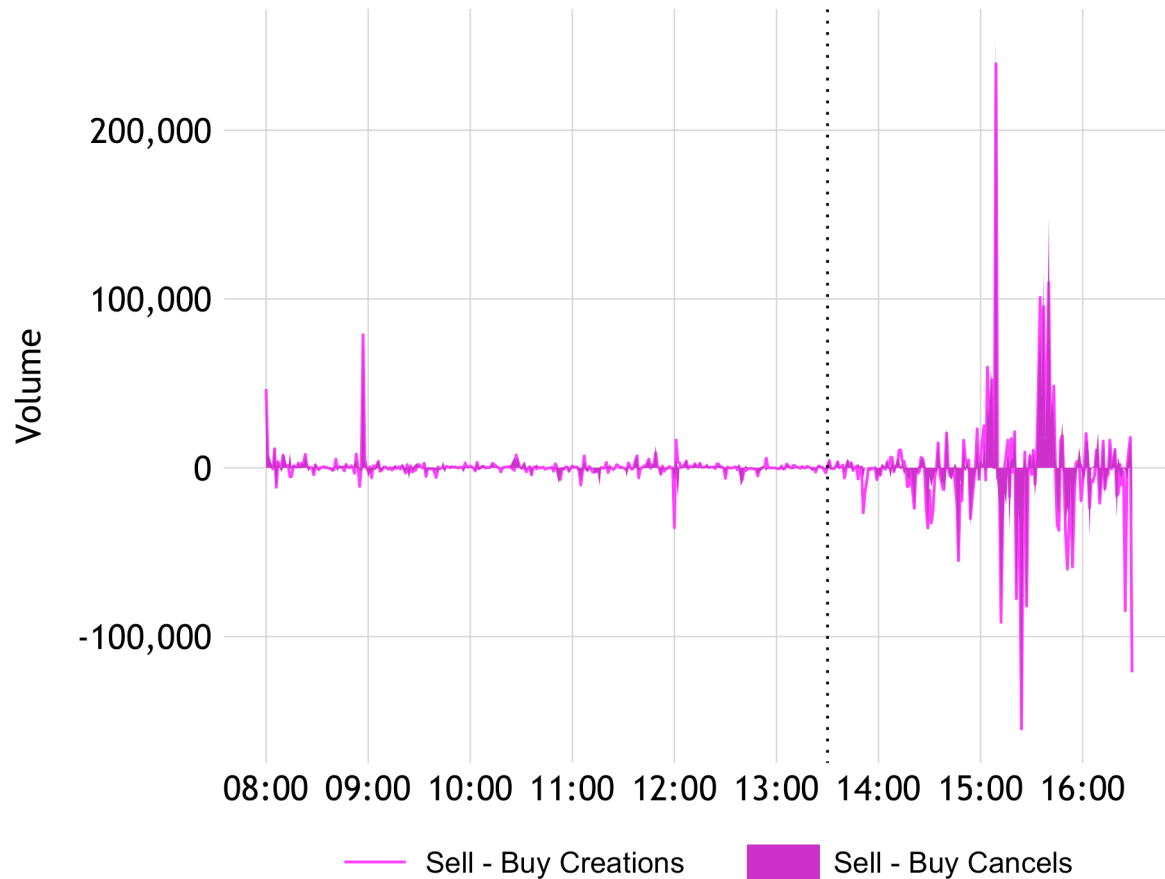
<sup>13</sup> See, e.g., Albert J. Menkveld, *High Frequency Trading and the New Market Makers*, 4 J. FIN. MKTS. 712 (2013) (showing how the revenue of a market maker is derived from interpreting the flow of orders in the market).

<sup>14</sup> See, e.g. Glosten & Milgrom, *supra* note 6 (positing a direction-neutral market maker).



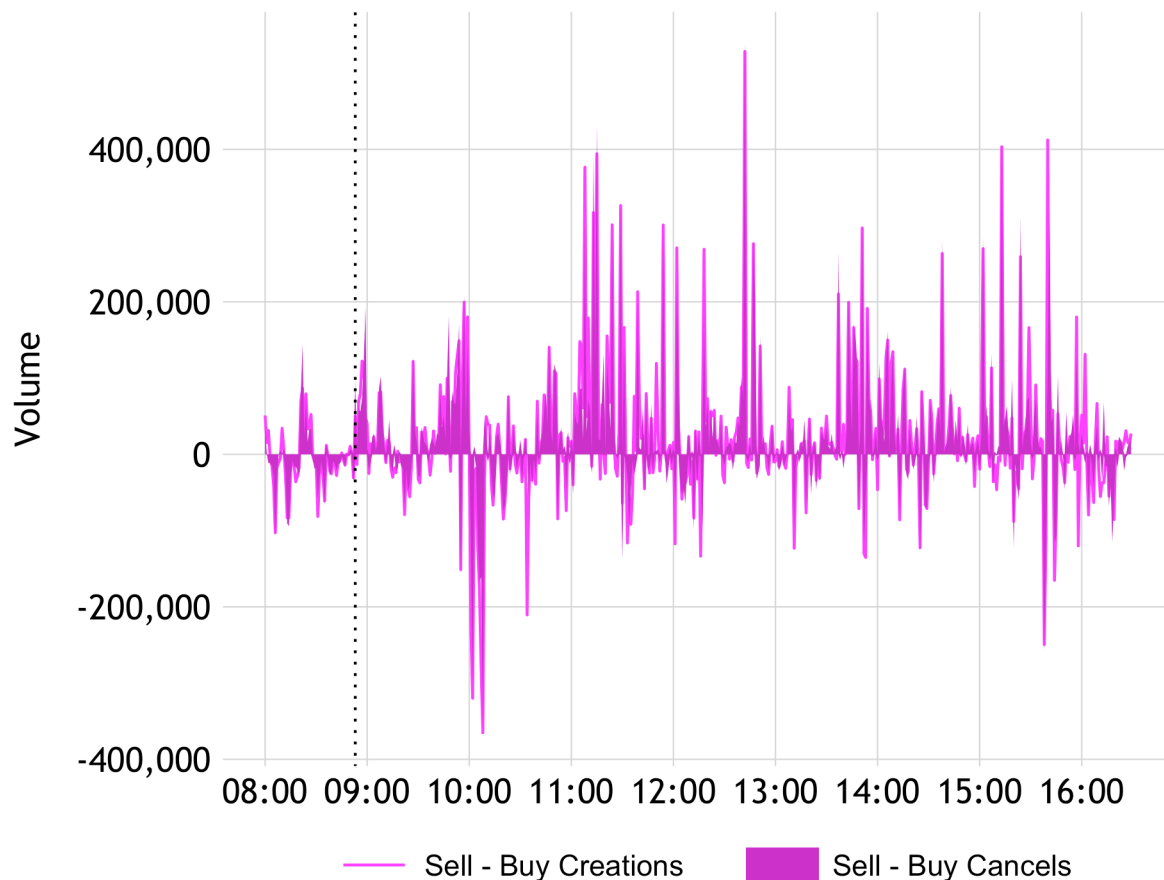
### Figure 5: Created vs. Cancelled Net Sell Order Flow Imbalance on 6 August 2019

This figure shows the imbalance in the volume of sell and buy orders for Burford's shares which were created and cancelled on 6 August 2019, prior to and following the posting of the Muddy Waters tweet. The solid line reflects the share volume of created sell orders minus created buy orders, while the shaded region reflects the share volume of cancelled sell orders minus cancelled buy orders. As before, the dotted line shows the time when the Muddy Waters tweet was posted on Twitter (1:30pm BST).



### Figure 6: Created vs. Cancelled Net Sell Order Flow Imbalance on 7 August 2019

This figure shows the imbalance in the volume of sell and buy orders for Burford's shares which were created and cancelled on 7 August 2019, prior to and following the posting of the first Muddy Waters tweet. The solid line reflects the share volume of created sell orders minus created buy orders, while the shaded region reflects the share volume of cancelled sell orders minus cancelled buy orders. As before, the dotted line shows the time when the Muddy Waters tweet was posted on Twitter (8:53am BST).



- 36) These figures show that prior to the Muddy Waters tweets, the sell-side imbalance is close to zero, which is what should occur when market makers provide liquidity to the market. But there were several unusual spikes in sell order cancellation imbalance—*i.e.*, an excess of sell order cancellations over buy order cancellations—in the hours following the Muddy Waters tweet.
- 37) On 6 August, there were 40 minutes after 1:30pm BST with a total net cancellation imbalance in favor of the sell side in excess of 10,000 shares. Over these minutes,

the total net sell-side cancellation imbalance exceeded 1.8 million shares, or approximately £22.7 million using average execution prices over that window. By comparison, only 4 minutes from 8am-1:30pm had a net sell-side cancellation imbalance in excess of 10,000 shares, which cumulate to just over 148,352 shares, or approximately £2 million using average execution prices. That is, after the posting of the Muddy Waters tweet, there was an increase of 11-fold in net sell-side cancellation imbalance in high net sell-side cancellation imbalance minutes.

- 38) On 7 August, there were 245 minutes after 8:53am BST with a total net cancellation imbalance in favor of the sell side in excess of 10,000 shares. Over these minutes, the total net sell-side cancellation imbalance exceeded 17.8 million shares, or approximately £104.9 million using average execution prices over that window. That is, after the posting of the Muddy Waters tweet on 7 August, there was an increase of 119-fold in net sell-side cancellation imbalance in high net sell-side cancellation imbalance minutes. In my opinion, this is strong evidence that the cancellation order flow was manipulative and not the result of ordinary market making.
- 39) Might these sell orders simply reflect a market reaction to the Muddy Waters tweet? For several reasons, in my opinion that interpretation is implausible. First, sell order *cancellations* are inconsistent with the market digesting the Muddy Waters tweet. Suppose the market had quickly read the report and reached a view that Burford's stock was overvalued. Market participants would immediately place—but *not cancel*—sell orders at or below the best offer to maximise their profits before the share price falls further. A wave of panicked selling by investors should not induce the sort of extreme spike in cancellations observed in the data.

- 40) To shed light on the nature of the spike in sell-side order cancellations after the posting of the Muddy Waters tweet, Table 2 and Table 3 present several orders which were cancelled within the same millisecond on 6 and 7 August, respectively.

**Table 2: Cancelled Sell Orders on 6 August 2019, 1:30pm-5pm BST**

This table presents examples of individual sell orders in Burford's stock from 1:30pm to 5pm BST, which were cancelled within the same millisecond.

Created Timestamp	Order Size	Order Price	Cancelled Timestamp	Best Offer When Created	% Above Best Offer
14:31:01.156677	724	1321	14:31:01.156929	1319	0.15%
14:35:34.255275	634	1299	14:35:34.255574	1297	0.15%
14:45:02.679887	130	1286	14:45:02.680346	1286	0%
14:59:08.212862	499	1259	14:59:08.213752	1259	0%
14:59:16.277414	499	1260	14:59:16.277895	1260	0%
15:11:04.582535	479	1247	15:11:04.582918	1244	0.24%
15:19:06.154011	340	1219	15:19:06.155008	1219	0%
15:24:37.726319	426	1207	15:24:37.726783	1207	0%
15:47:30.666847	721	1127	15:47:30.667231	1127	0%
15:49:09.716878	492	1119	15:49:09.717211	1102	1.54%
15:52:36.309552	100	1159	15:52:36.310045	1150	0.78%
15:57:41.719505	527	1167	15:57:41.719810	1167	0%
16:04:13.633908	1896	1147	16:04:13.634274	1147	0%
16:10:06.240546	1515	1142	16:10:06.240850	1117	2.24%
16:10:07.281512	1515	1142	16:10:07.281750	1121	1.87%
16:10:08.198074	1259	1142	16:10:08.198328	1125	1.51%
16:10:44.016722	89	1142	16:10:44.017503	1138	0.35%
16:16:22.785547	55	1144	16:16:22.786308	1141	0.26%
16:22:52.030900	12	1126	16:22:52.031219	1126	0%
16:24:06.438604	1103	1124	16:24:06.438970	1124	0%

**Table 3: Cancelled Sell Orders on 7 August 2019, 8:53am-5pm BST**

This table presents examples of individual sell orders in Burford's stock from 8:53am to 5pm BST, which were cancelled within the same millisecond.

Created Timestamp	Order Size	Order Price	Cancelled Timestamp	Best Offer When Created	% Above Best Offer
09:05:03.808856	600	1095.0	09:05:03.809171	1091.0	0.37%
09:08:41.825864	482	1080.0	09:08:41.826356	1080.0	0%
09:27:32.728894	2178	998.5	09:27:32.729434	998.5	0%
09:27:57.202790	2178	994.0	09:27:57.203666	994.0	0%
09:28:43.890618	1682	989.5	09:28:43.891091	989.5	0%
10:50:56.678916	1530	584.0	10:50:56.679328	582.5	0.26%
11:05:12.465336	1226	549.5	11:05:12.465780	549.5	0%
12:20:07.381983	1479	591.0	12:20:07.382847	591.0	0%
12:51:55.712745	1195	547.0	12:51:55.713193	547.0	0%
13:09:21.757005	681	529.5	13:09:21.757242	529.5	0%
13:25:50.082545	561	533.5	13:25:50.083200	533.5	0%
13:46:47.535670	1281	474.4	13:46:47.536031	474.4	0%
14:09:28.774213	1473	477.6	14:09:28.774482	474.6	0.63%
14:12:01.136332	1606	484.0	14:12:01.136715	484.0	0%
14:12:02.148042	1646	481.8	14:12:02.148561	481.8	0%
14:12:08.645438	1584	487.8	14:12:08.645920	483.0	0.99%
14:16:32.942841	1370	472.6	14:16:32.943614	472.6	0%
14:17:34.903997	217	473.6	14:17:34.904445	473.6	0%

- 41) As these tables demonstrate, large blocks of sell orders were created and cancelled in rapid succession within microseconds of each other and were often above the contemporaneous best offer. By comparison, from 1 July to 31 July 2019, orders for 1,164 sell-side shares were cancelled, on average, for each *minute* of trading. A microsecond is one millionth of a second, and a large number of cancellations in such a short time suggests the relevant market participants did not have a genuine intention to sell Burford's stock. Market participants holding a negative view of Burford's stock would not place limit orders *at or above* the best offer—rather, they would place sell orders *below* the best offer, *e.g.*, via a market sell order which

matches against a resting buy-side order at the *best bid*. A genuine seller would not cancel orders *en masse* but would allow the orders to be executed.

## V. ABNORMAL CANCELLATION VOLUME

- 42) There will always be a correlation between the number of orders created and the number of orders cancelled. Many orders are not executed, become stale as the price oscillates, and need to be resubmitted at an updated price. In this Section, I show that the order cancellations observed immediately following the posting of the Muddy Waters tweet are *statistically abnormal*, and not merely expected due to an increase in new sell-side orders.
- 43) I employ two kinds of analysis in this regard. The first is to simply control for the volume of sell-side orders created in different bands relative to the current best offer: at or below the best offer, 0-0.25%, 0.25-0.33%, 0.33-0.5%, 0.5-1%, 1-3%, 3-5%, and 5-10%. I estimate the ordinary relationship between the creation and cancellation of sell-side orders at those bands over an unaffected period (1 July to 31 July 2019) and use that relationship to estimate the abnormal level of sell-side order cancellations on 6 and 7 August 2019 by order book band.
- 44) The second analysis is a type of “double control” which adjusts not only for the ordinary relationship between sell-side order creations and cancellations, but also for the creation and cancellation of orders on the *buy*-side of the limit order book. I estimate the same ordinary relationship between the creation and cancellation of buy-side orders at those bands over an unaffected period (1 July to 31 July 2019), and use that relationship to estimate the abnormal level of buy-side order cancellations on 6 and 7 August 2019 by order book band. I then subtract that

“abnormal buy-side” cancellation volume from the “abnormal sell-side” cancellation volume to yield a “net abnormal sell-side” cancellation volume.

**A. Analysis 1: Abnormal Sell-Side Order Cancellations**

- 45) I calculate the ordinary sell-side cancellation volume at 1-minute intervals given the sell-side order creation volume in those intervals, within each of the price bands, by estimating a statistical model over 1 July to 31 July 2019.<sup>15</sup> I use this model to estimate the “expected” sell-side cancellation volume given the actual volume of created sell-side shares, over 6 and 7 August 2019. I subtract this “expected” sell-side cancellation volume from the actual sell-side cancellation volume over those days to yield an “abnormal” sell-side cancellation volume. I cumulate this abnormal cancellation sell-side volume over 6 and 7 August 2019. The results are shown in Figure 7 and Figure 8.<sup>16</sup>

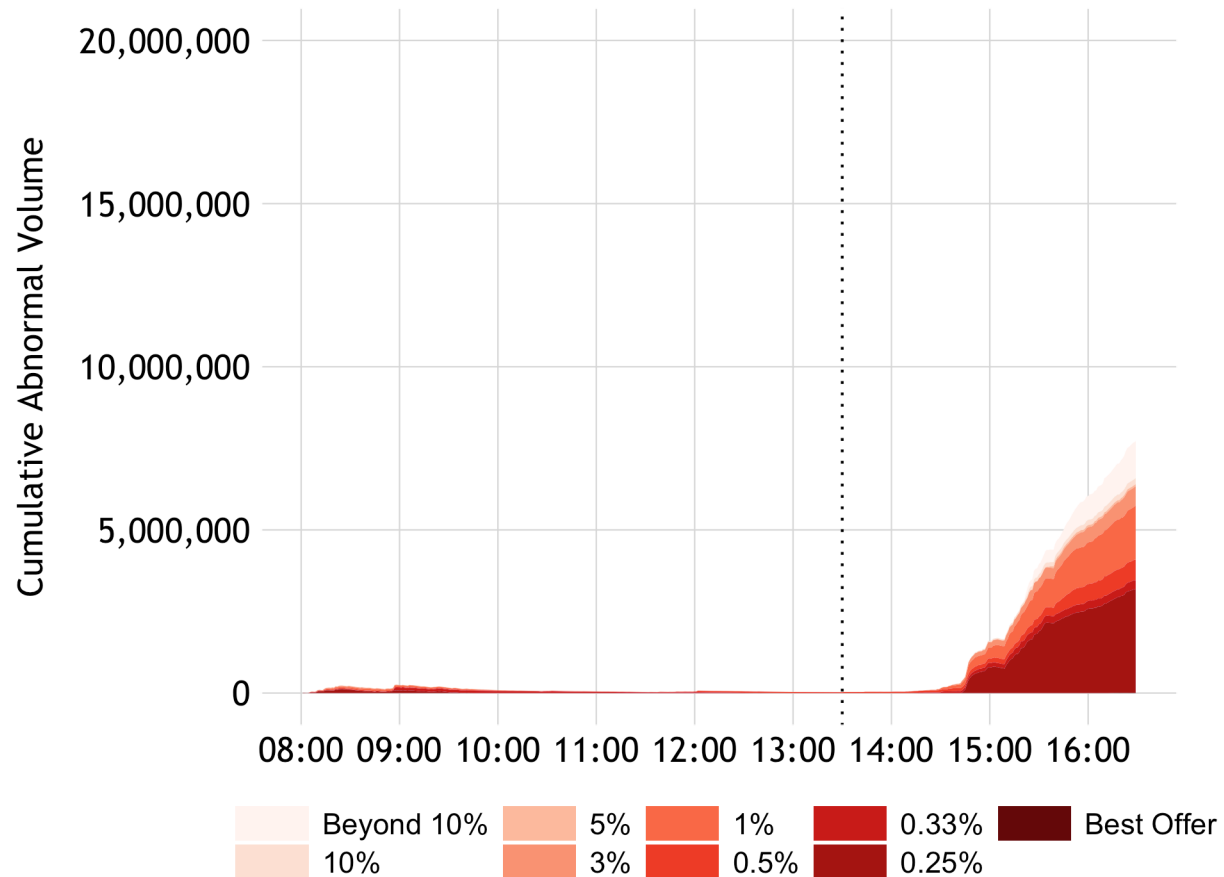
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<sup>15</sup> I employ a linear regression specification consistent with peer-reviewed literature on cancellation rates. See, e.g., Kingsley Y.L. Fong & Wai-Man Liub, *Limit Order Revisions*, 34 J. BANK. & FIN. 1873, 1878 (2010) (estimating different cancellation rates by order book bands).

<sup>16</sup> In the visual presentation of the cumulative abnormal volume over time across the price bands, I replace negative cumulative abnormal volume with zero for this figure, as well as for the buy-side and net figures below. This does *not* affect the underlying minute-by-minute abnormal volumes (which may take on negative values), but simply ensures that the presentation only shows those minutes where the cumulation of those abnormal volumes, as of that minute, is positive. Minutes where the cumulative abnormal volume is negative are simply shown as zero to facilitate the presentation of the data in an area chart.

### Figure 7: Cumulative Volume of Abnormal Sell-Side Order Cancellations: 6 August

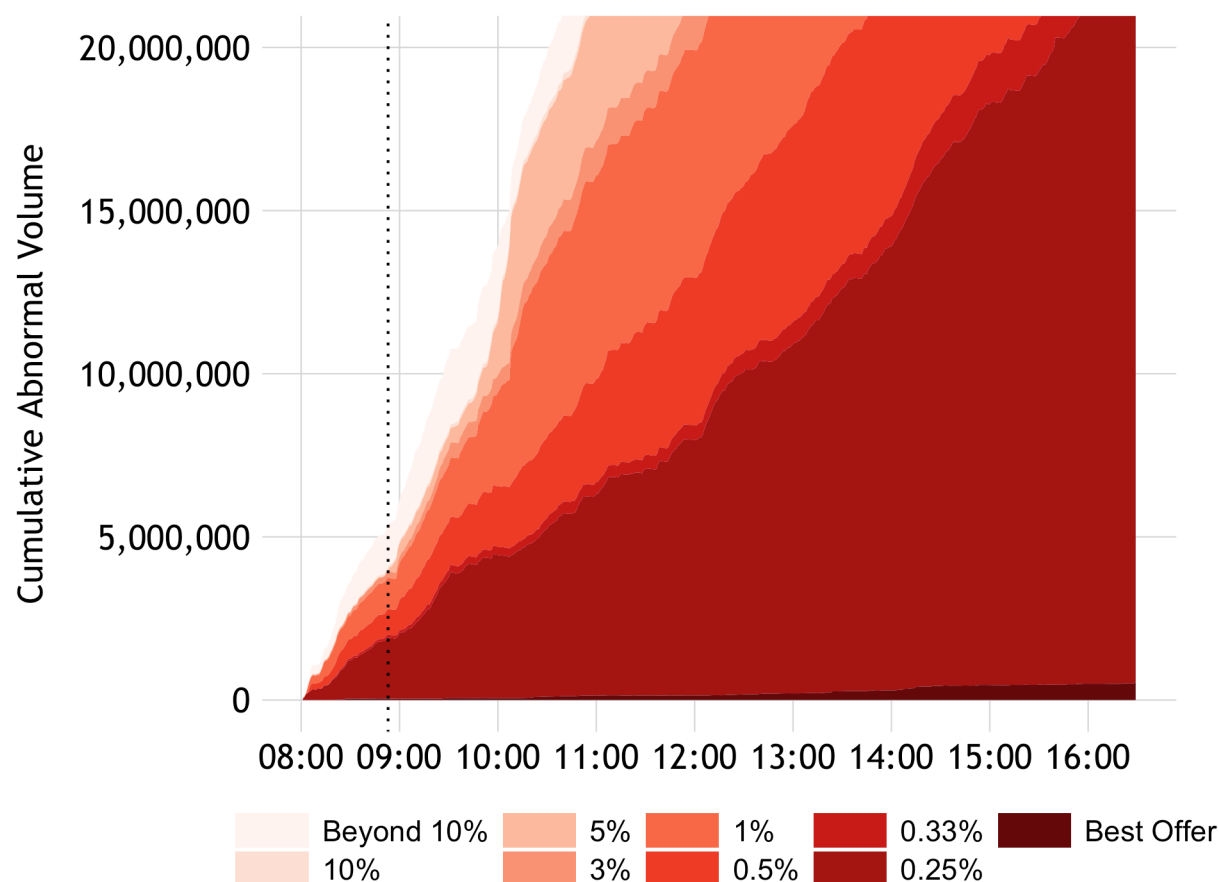
This figure shows the cumulative volume of abnormal sell-side order cancellations at 1-minute intervals, prior to and following the posting of the Muddy Waters tweet on 6 August 2019. The term “abnormal” refers to order cancellation volume in excess of the expected cancellation volume given the volume of orders created in that minute, based on a linear regression fitted to intraday trading data at 1-minute intervals from 1 July to 31 July 2019.





### Figure 8: Cumulative Volume of Abnormal Sell-Side Order Cancellations: 7 August

This figure shows the cumulative volume of abnormal sell-side order cancellations at 1-minute intervals, prior to and following the posting of the Muddy Waters tweet on 7 August 2019. The term “abnormal” refers to order cancellation volume in excess of the expected cancellation volume given the volume of orders created in that minute, based on a linear regression fitted to intraday trading data at 1-minute intervals from 1 July to 31 July 2019.



### B. Analysis 2: Net Abnormal Sell-Side Order Cancellations

- 46) In this second analysis, I address the concern that these results might reflect ordinary market making activities by analysing the buy side of the limit order book. In particular, because market makers are neutral suppliers of liquidity with respect to the direction of the underlying stock, in principle they should be no more likely to cancel sell orders than to cancel buy orders. Moreover, market makers should be more likely to cancel buy orders than sell orders in response to

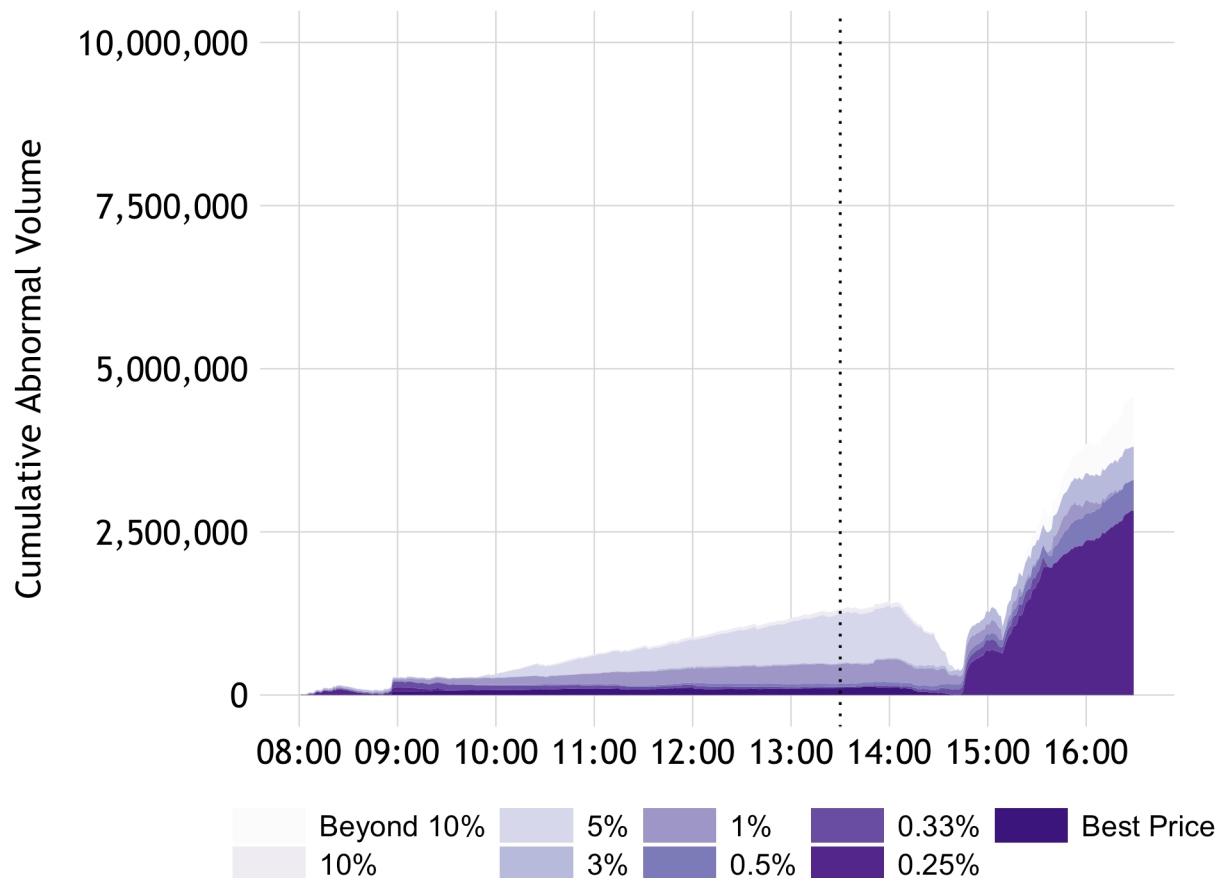
genuine selling of Burford's stock. Suppose that market makers faced a wave of new sellers in response to the Muddy Waters tweet. Because market makers always take the opposite side of a trade, a wave of sell-side supply in the market manifests as an unexpected increase in *buy-side* executions which should lead to excess cancellations on the buy side of the market.

- 47) For example, suppose that a market maker has posted two bids for a stock: £9.99, which is the best bid, and £9.98, which is one pence below the best bid. A pessimistic seller enters the market and places a market sell order, which executes against the best bid at £9.99. To ensure that her portfolio remains balanced without too many purchases, such a market maker might rationally cancel her bid at £9.98 and place a new bid at £9.97. A wave of sell orders matching against outstanding buy limit orders manifests as order cancellations on the *buy* side.
- 48) For these reasons, a *sell-side* imbalance of abnormal order cancellations—*i.e.*, an excess of abnormal sell-side order cancellations relative to abnormal buy-side order cancellations—is inconsistent with legitimate market making. Rather, a large imbalance of abnormal sell-side order cancellations is consistent with manipulative creation of an artificial appearance of excess supply of the stock, which has the effect of inducing market makers to lower their bids, ensuring that the next sell order for Burford's stock will match against a lower bid, *i.e.*, lowering the price.
- 49) I estimate the same ordinary relationship between the creation and cancellation of buy-side orders over 1 July to 31 July 2019, and use that relationship to estimate the abnormal level of buy-side order cancellations on 6 and 7 August 2019 by order book band. I then subtract that "abnormal buy-side" cancellation volume from the "abnormal sell-side" cancellation volume to yield a "net abnormal sell-side"

cancellation volume. I cumulate this abnormal cancellation sell-side volume over 6 and 7 August and present the results in Figure 9 and Figure 10.

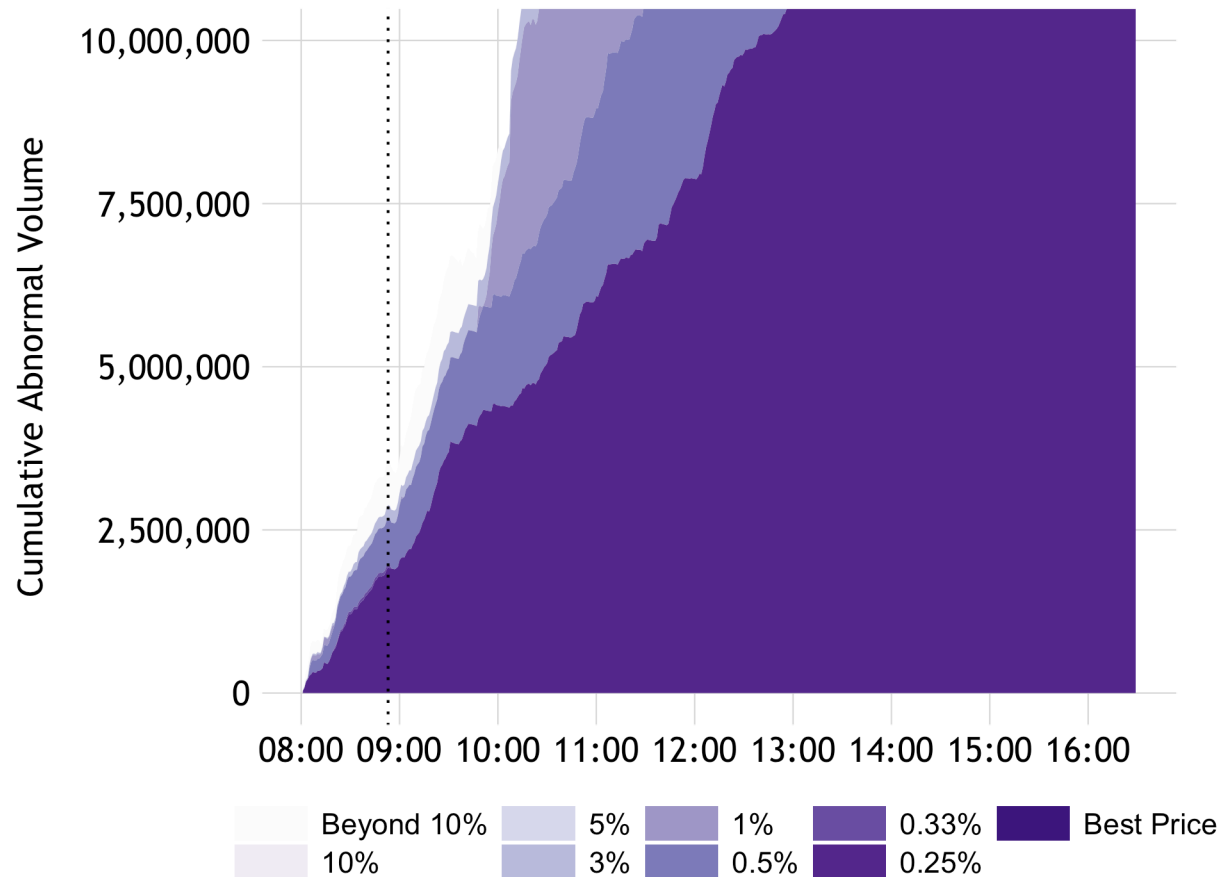
### Figure 9: Cumulative Net Abnormal Sell-Side Order Cancellations: 6 August

This figure shows the cumulative volume of abnormal sell-side order cancellations at 1-minute intervals in excess of abnormal buy-side order cancellations, prior to and following the posting of the Muddy Waters tweet on 6 August 2019. The term “abnormal” refers to order cancellation volume in excess of the expected cancellation volume given the volume of orders created in that minute, based on a linear regression fitted to 1-minute intervals from 1 July to 31 July 2019.



### Figure 10: Cumulative Net Abnormal Sell-side Order Cancellations: 7 August

This figure shows the cumulative volume of abnormal sell-side order cancellations at 1-minute intervals in excess of abnormal buy-side order cancellations, prior to and following the posting of the Muddy Waters tweet on 7 August 2019. The term “abnormal” refers to order cancellation volume in excess of the expected cancellation volume given the volume of orders created in that minute, based on a linear regression fitted to 1-minute intervals from 1 July to 31 July 2019.



- 50) As these figures show, there is a sharp increase in excess cumulative abnormal sell order cancellations relative to cumulative abnormal buy order cancellations deep in the limit order book after the posting of the Muddy Waters tweets on 6 and 7 August 2019. The imbalance of abnormal sell order cancellations over abnormal buy order cancellations continues throughout the trading day as the price of Burford’s stock declines.

- 51) Indeed, the abnormal net sell-side cancellation imbalance totaled 1,055,747 and 10,432,638 shares on 6 and 7 August, respectively. In my opinion, such a large imbalance is inconsistent with ordinary market making. This evidence strengthens the inference that Burford's share price was subject to market manipulation in the form of spoofing and layering because the volume of abnormal sell-side order cancellations deeper in the limit order book far exceeded the volume of abnormal buy-side order cancellations.

## V. SPOOFING AND LAYERING LOOPS

- 53) A standard way to identify indicia of spoofing and layering is by measuring "loops," specific patterns consistent with manipulation rather than ordinary market making.<sup>17</sup> A spoofing and layering loop consists of the following pattern:
- a) First, a large number of orders on the sell side of the limit order book are created to simulate the appearance of a wave of supply, which leads to a downward revision of the best bid on the buy-side of the limit order book;
  - b) Second, an order is executed which was resting on the buy-side of the limit order book, generally at the best bid, which leads to a decline in the share price because this order is matched against an incoming sell order *below* the best offer (such as a market sell order which always executes against the best bid);<sup>18</sup>

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<sup>17</sup> See, e.g., Expert Report of Terrence Hendershott, Ph.D., *SEC v. Lek Securities*, Case No. 1:17-cv-01789-DLC, Apr. 3, 2017, at \*8 (defining a loop as a large number of "Loud-side" orders, in order to "mislead other market participants to benefit the layering trader's Quiet-side transactions.").

<sup>18</sup> This incoming sell order may originate from the ordinary flow of purchases and sales for reasons unrelated to the manipulation. Because this ordinary order flow is balanced, the stock price declines when

- c) Finally, either prior to the execution of the buy-side order or subsequently thereafter, the original sell-side orders are cancelled, revealing their false nature.
- 54) To identify spoofing and layering loops on 6 and 7 August 2019, I employ similar criteria to those utilised in expert opinions in market manipulation actions.<sup>19</sup> In particular, for every buy-side limit order executed in Burford's stock, I tabulate the share volume of sell orders which were created between that buy-side limit order and the one preceding it, and then subsequently cancelled thereafter. Because sell orders will naturally arrive over time for reasons unrelated to spoofing or layering, I further normalise this cancelled share volume by dividing by the number of seconds which passed between the buy-side limit order and the one preceding it.
- 55) To take a simple example, suppose that a buy-side limit order executes at 10:00:00am, and then another one executes at 10:00:03am. In between these two limit orders, 1,000 sell-side orders are created, of which 900 are ultimately cancelled. The spoofing and layering loop calculation is as follows: 900 cancelled shares divided by 3 seconds yields 300 cancelled shares per second.
- 56) Prior to the Muddy Waters tweet at 1:30pm BST on 6 August, there were, on average, 120 sell-side shares created per second which were subsequently cancelled prior to each executed buy order, of which approximately 100 shares were non-marketable sell orders created deep in the limit order book and then subsequently cancelled. Following the tweet on 6 August, these figures jump to

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the creation of a large number of orders on the sell-side of the limit order book induces a decline in the best bid, such that even a balanced flow of purchases and sales will occur at lower prices, on average.

<sup>19</sup> See Expert Report of Terrence Hendershott, Ph.D., *supra* note 17. Professor Hendershott characterised his own criteria as "conservative." *Id.* at \*8.

1,259 and 1,064 shares, respectively—a 10-fold increase. And on 7 August, these figures jump to 3,528 and 2,658 shares, respectively—a 29-fold increase. These differences are extremely unlikely to have occurred by random chance.

- 57) To illustrate spoofing and layering loops observed after the Muddy Waters tweets on 6 and 7 August, I identify a selection of sell orders created and cancelled prior to the execution of buy orders in Burford Capital's stock at 14:43:44.123390 BST on 6 August and 08:24:34.270046 BST on 7 August.
- 58) On 6 August at 14:43:44.123390 BST, buy-side orders for 400 shares were executed at an average price of 1292 GBX, a decline of 1.17% from the preceding buy-side orders executed at 14:43:16.145673 BST. Between the execution of these two buy-side orders, sell orders for 129,120 shares were created and cancelled, of which 113,845 shares (88%) were above the best offer.
- 59) Similarly, on 7 August at 08:24:34.270046 BST, buy-side orders for 958 shares were executed at an average price of 1225 GBX, a decline of 0.87% from the preceding buy-side orders executed at 08:24:10.568806 BST. Between the execution of these two buy-side orders, sell orders for 65,636 shares were created and cancelled, of which 46,588 shares (71%) were above the best offer. These examples show how a substantial share price decline on a small volume of buy-side executions was induced by the creation and cancellation of large blocks of sell-side shares.
- 60) Table 4 presents sell orders in Burford's stock between 14:43:16.145673 BST and 14:43:44.123390 BST on 6 August, which were subsequently cancelled. Similarly, Table 5 presents sell orders in Burford's stock between 08:24:10.568806 BST and 08:24:34.270046 BST on 7 August, which were subsequently cancelled. As the tables show, much of the cancelled sell-side share volume was placed above the contemporaneous best offer at the time that the orders were created.

**Table 4: Example of Spoofing and Layering Loop on 6 August**

This table presents a loop of cancelled sell orders in Burford's stock between 14:43:16 BST and 14:43:44 BST on 6 August which induced a buy-side execution. As the table shows, much of the cancelled share volume was placed above the contemporaneous best offer when the orders were created.

<b>Created Timestamp</b>	<b>Order Size</b>	<b>Order Price</b>	<b>Cancelled Timestamp</b>	<b>Best Offer When Created</b>	<b>% Above Best Offer</b>
14:43:16.384814	130	1312	14:43:16.385170	1311	0.08%
14:43:16.460046	2000	1376	14:47:43.683731	1311	4.96%
14:43:16.820368	1000	1376	14:47:43.604166	1311	4.96%
14:43:16.877458	1000	1376	16:22:56.761954	1311	4.96%
14:43:16.891731	397	1313	14:43:18.832022	1311	0.15%
14:43:17.066868	152	1314	14:43:18.830988	1311	0.23%
14:43:17.076718	5000	1376	15:27:45.727577	1311	4.96%
14:43:17.134123	1000	1376	15:34:40.464243	1311	4.96%
14:43:17.510503	492	1311	14:43:21.476667	1311	0%
14:43:17.511322	492	1314	14:43:21.474956	1311	0.23%
14:43:17.511656	143	1313	14:43:17.516410	1313	0%
14:43:17.511688	2720	1316	14:43:23.203214	1311	0.38%
14:43:17.513324	130	1312	14:43:17.516191	1311	0.08%
14:43:17.515886	251	1310	14:43:18.090807	1310	0%
14:43:18.073275	1500	1374	14:57:39.569338	1311	4.81%
14:43:18.091072	130	1312	14:43:18.254009	1311	0.08%
14:43:18.253737	120	1311	14:43:18.854470	1311	0%
14:43:18.253743	689	1311	14:43:18.854471	1311	0%



**Table 5: Example of Spoofing and Layering Loop on 7 August**

This table presents individual sell orders in Burford's stock between 08:24:10.568806 BST and 08:24:34.270046 BST on 7 August, which were subsequently cancelled. As the table shows, much of the cancelled share volume was placed above the contemporaneous best offer when the orders were created.

Created Timestamp	Order Size	Order Price	Cancelled Timestamp	Best Offer When Created	% Above Best Offer
08:24:10.573847	197	1248	08:24:10.742103	1248	0%
08:24:10.606446	122	1250	08:24:30.935007	1250	0%
08:24:10.606450	442	1250	08:24:30.935012	1248	0.16%
08:24:10.665146	5000	1305	08:47:53.437252	1248	4.57%
08:24:10.665247	1000	1305	08:36:20.491408	1248	4.57%
08:24:10.738185	637	1239	08:24:10.852740	1239	0%
08:24:10.738188	122	1239	08:24:10.852742	1239	0%
08:24:10.738303	400	1244	08:24:57.074779	1239	0.4%
08:24:10.738683	400	1238	08:24:22.126560	1238	0%
08:24:10.738692	211	1249	08:24:30.915524	1238	0.89%
08:24:10.738795	168	1238	08:24:22.126571	1238	0%
08:24:10.739124	160	1237	08:24:10.853040	1237	0%
08:24:10.739231	168	1237	08:24:12.918498	1237	0%
08:24:10.843360	1000	1305	08:33:31.837902	1237	5.5%
08:24:10.852859	584	1248	08:24:10.977233	1237	0.89%
08:24:10.852864	122	1248	08:24:10.977236	1248	0%
08:24:12.607858	373	1242	08:24:12.921658	1237	0.4%

- 61) These findings are highly consistent with spoofing and layering because they show that the buy-side limit order executions, which were reflected as a decline in the price of Burford's stock, were directly preceded by non-*bona fide* sell-side orders which were later cancelled.
- 62) In addition, I examine extraordinary episodes of order cancellations in the minutes immediately preceding the Muddy Waters tweet on 7 August. In light of online

forum posts suggesting that a Burford tag appeared on its website at 8:52am that day,<sup>20</sup> I examine a period ending just prior to that minute.

- 63) Over the six-minute period from 8:46am to 8:51am on 7 August there were a total of 432,935 sell-side shares cancelled prior to buy-side executions, of which 383,967 were deep in the limit order book, *i.e.*, above the best offer. By way of comparison, from 8:00am to 8:46am, on average, there were 20,546 and 17,483 sell-side shares cancelled prior to buy-side executions per minute, or 123,278 and 104,898 over a six-minute period. Put differently, the share volume of sell-side cancelled orders prior to buy-side executions in the six minutes preceding the Muddy Waters tweet was four times as large as the average in the preceding minutes.

## VI. PRICE RESPONSE

- 65) The decline in the price of Burford's stock on 6 and 7 August was driven by large waves of sell-side order cancellations. During five one-minute periods on 6 August (14:43, 14:47, 15:09, 15:40, 15:41), Burford's stock fell 6.5%, or over £170 million. During these periods, on average, 72,821 net sell-side shares were cancelled per minute (*i.e.*, after subtracting buy-side order cancellations).
- 66) Similarly, during ten one-minute periods on 7 August (08:17, 08:22, 08:53, 09:22, 09:51, 10:51, 11:14, 11:22, 13:52, 15:32), Burford's stock fell 48.6%, or over £868

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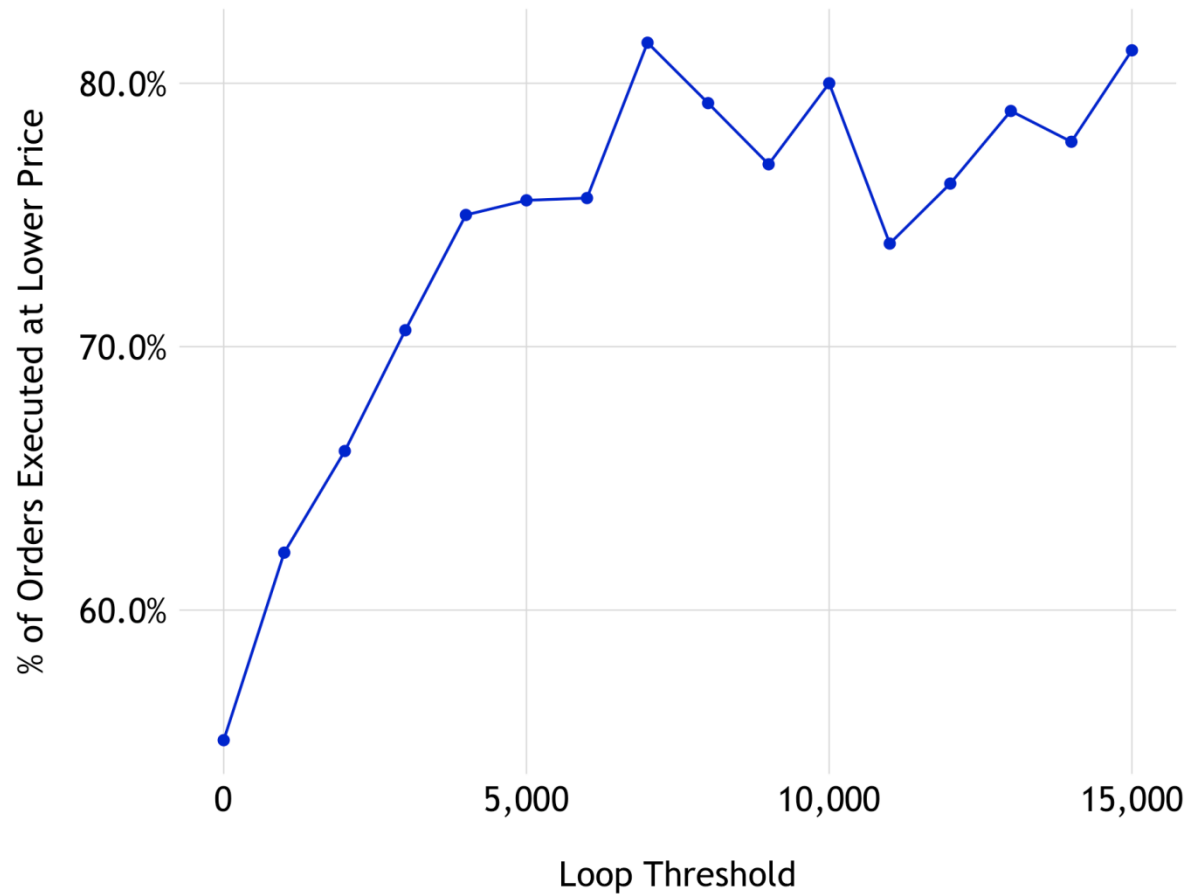
<sup>20</sup> U.K. ADVFN, *Burford Capital Share Discussion Threads*, [https://uk.advfn.com/stock-market/london/burford-capital-BUR/share-chat?page=318&xref=chatnav\\_i\\_5\\_b](https://uk.advfn.com/stock-market/london/burford-capital-BUR/share-chat?page=318&xref=chatnav_i_5_b) (posting the following at 8:52am: "No content for the moment, but Muddy Waters has created Burford tag on their webpage <https://www.muddywatersresearch.com/research/bur/>").

million. During these periods, on average, 46,860 net sell-side shares were cancelled per minute (*i.e.*, after subtracting buy-side order cancellations)

- 67) By comparison, from 1 July to 31 July 2019, on average 0.21 net sell-side shares were cancelled per minute—orders of magnitude smaller than on 6 and 7 August. On the other hand, during periods of time when Burford’s share price rose, more buy-side shares were abnormally cancelled than sell-side shares.
- 68) The extremely large net sell-side cancellation volume during the minutes when Burford’s share price decreased is strong evidence that the price decline on 6 and 7 August 2019 was not induced by ordinary trading in Burford’s stock. This evidence is consistent with the intentional creation and cancellation of vast quantities of limit orders on the sell-side of the limit order book.
- 69) To further demonstrate how the price decline was induced by manipulative spoofing and layering, I examine the link between spoofing and layering loops and high-frequency price changes. I find that the execution of buy-side limit orders preceded by the net sell-side cancellation of more than 15,000 shares are executed at a price lower than the immediately preceding buy-side limit order 81% and 75% of the time on 6 and 7 August, respectively, as compared to 38% and 37% of the time when preceded by the net cancellation of 15,000 shares or less.
- 70) To illustrate that this relationship is not driven by the choice of an arbitrary threshold for the existence of a spoofing and layering loop, Figure 11 and Figure 12 plot the proportion of buy-side limit orders which executed at a price lower than the immediately preceding buy-side limit order after the Muddy Waters tweet on 6 and 7 August, as a function of the threshold value of net sell-side cancellations. As the figures show, the chance of a price decline increases as the spoofing and layering loop becomes more intense.

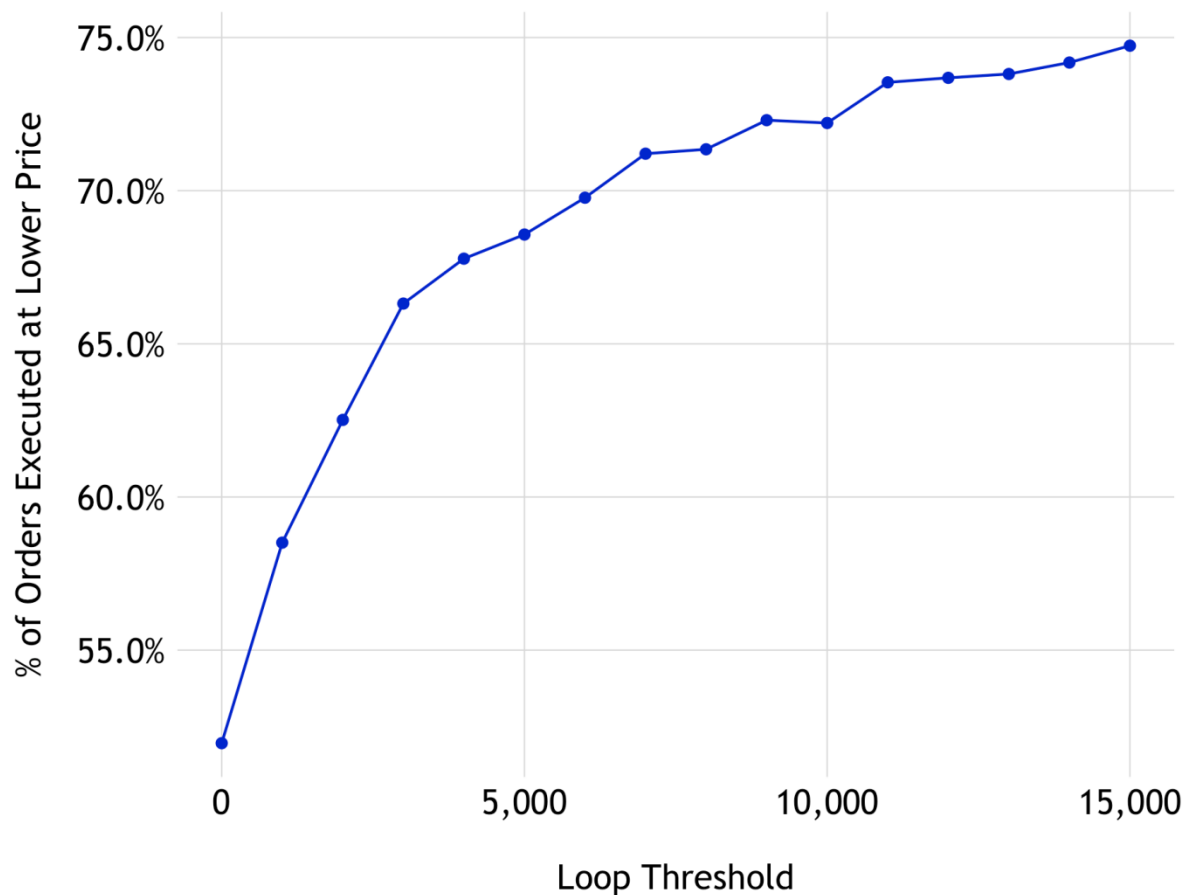
### Figure 11: Price Declines and Loop Intensity: 6 August

This figure shows the proportion of buy-side limit orders which were followed by a price decline on 6 August after the posting of the Muddy Waters tweet, as a function of the net sell-side order cancellation intensity threshold used to define a spoofing and layering loop. As the figure shows, the likelihood of a price decline increases as the volume of net cancelled sell-side order cancellations increases prior to the execution of the buy-side limit order.



### Figure 12: Price Declines and Loop Intensity: 7 August

This figure shows the proportion of buy-side limit orders which were followed by a price decline on 7 August after the posting of the Muddy Waters tweet, as a function of the net sell-side order cancellation intensity threshold used to define a spoofing and layering loop. As the figure shows, the likelihood of a price decline increases as the volume of net cancelled sell-side order cancellations increases prior to the execution of the buy-side limit order.



71) In my opinion, these facts indicate that the share price of Burford Capital's common stock was subject to manipulation on 6 and 7 August 2019.

Dated: September 27, 2019

  
Professor Joshua Mitts PhD

## APPENDIX A: CREDENTIALS

- 72) I am an Associate Professor of Law at Columbia University, and the principal of M Analytics LLC, a consulting firm specialising in financial economics. I hold a PhD in Finance & Economics from Columbia University, a JD from Yale University, and a BA in Liberal Studies from Georgetown University.
- 73) I have published in the fields of finance and law and economics. My articles are forthcoming or have appeared in peer-reviewed journals including the *Journal of Finance*, the *Journal of Institutional and Theoretical Economics*, the *Journal of Law and Economics*, the *International Review of Law and Economics*, the *Journal of Financial Regulation*, as well as the *Business Lawyer*, the *Yale Law Journal*, the *Cornell Law Review*, the *Harvard Business Law Review* and others.
- 74) I have been invited to present my research at numerous conferences and workshops in finance and law and economics, including the Annual Meeting of the American Finance Association, the Annual Meeting of the American Law & Economics Association, the Conference on Empirical Legal Studies, the Columbia Business School Conference on News and Finance, the 8th Symposium on Intelligent Investing at Ivey Business School, and workshops at Harvard University, Columbia University, New York University, University of Texas at Austin, and Vanderbilt University.
- 75) I have reviewed articles for peer-reviewed journals in finance and law and economics including the *Review of Financial Studies*, the *Journal of Legal Studies*, the *International Review of Law and Economics*, and the *Journal of Empirical Legal Studies*. My research and commentary have been featured in the *Wall Street Journal*, *Reuters*,

*Bloomberg, the Washington Post, MarketWatch, Law360, Bloomberg Law, Bloomberg View, Bloomberg BNN, and the Globe and Mail.*

- 76) In 2018, I posted a paper entitled *Short and Distort* to the Social Science Research Network, which shows how short seller attacks on public companies are followed by share price declines and sharp reversals. My work finds that these patterns are likely driven by manipulative stock options trading by pseudonymous authors. Among 1,720 pseudonymous attacks on mid- and large-cap firms from 2010-2017, I identify over \$20.1 billion of mispricing. This paper has been invited for resubmission at the *Journal of Legal Studies*, a leading peer-reviewed law and economics journal published by the University of Chicago Press.
- 77) In addition to my research, teaching and academic responsibilities, I consult on several ongoing matters involving on securities fraud and market manipulation. My research and expert opinion have been presented to the U.S. Securities and Exchange Commission and other regulatory bodies.
- 78) At Columbia University, I have taught courses on securities regulation, data science, and contracts. My courses encompass economic theory and quantitative methods of valuation, asset pricing, investments, and data analytics, as well as the economics of securities fraud, market manipulation and insider trading.
- 79) I am a member of the American Finance Association, the American Law and Economics Association, the Society of Empirical Legal Studies, and the New York City Bar Association, where I serve on the Securities Litigation Committee.